I HEREBY CERTIFY THAT THIS CORRESPONDENCE IS BEING TRANSMITTED VIA EFS-WEB TO: THE COMMISSIONER FOR PATENTS, ALEXANDRIA, V.A. ON: _____ Signature & Date	**NON-FINAL - OFFICIAL**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	) **Attorney Docket No.** FIS920030377US1
	) **Confirmation No.** 6138
Huang et al.	)
	)
Serial No.: 10/716,785	) **Examiner:** Sin J. Lee
Filed: November 19, 2003	) **Group Art Unit:** 1752
For: SILICON-CONTAINING RESIST SYSTEMS WITH CYCLIC KETAL PROTECTING GROUPS	)
	) **Date:** April 27, 2006

The Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

AMENDMENT

Sir:

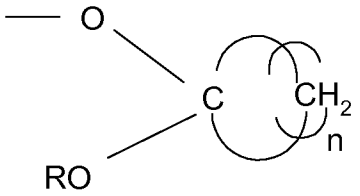
In response to the Office Action dated January 27, 2006, please amend the above-identified Application as follows:

AMENDMENTS TO THE CLAIMS:

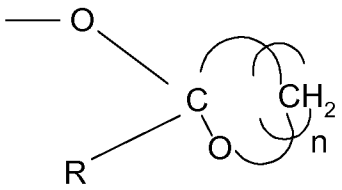
This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A resist composition, said composition comprising an acid-sensitive imaging polymer including a silsesquioxane backbone and a solubility inhibiting cyclic ketal pendant acid-labile moiety having a low activation energy less than about 20 kcal/mol for acid-catalyzed cleaving, wherein said acid-labile moiety is cleavable at room temperature, and wherein said cyclic ketal acid-labile moiety comprises a structure of the form



or



where n is any integer from 2 to 15 and R is an alkyl or a halogenated alkyl, and wherein at least a portion of said imaging polymer is fluorinated and said imaging polymer further comprises a pendant solubility promoting moiety selected from the group consisting of a fluoroalcohol, a carboxylic acid, an amino group, an imino group, a fluorinated imino group and a fluorinated amino group, wherein said pendant solubility promoting moiety is protected with said cyclic ketal acid-labile moiety.

2. (Original) The resist composition of claim 1, further comprising a radiation-sensitive acid generator.

3. (Canceled)

4. (Canceled)

5. (Original) The resist composition of claim 1, wherein at least a portion of said solubility inhibiting pendant cyclic ketal acid-labile moiety is fluorinated.

6. (Canceled)

7. (Original) The resist composition of claim 1, wherein said cyclic ketal acid-labile moiety is selected from the group consisting of methoxycyclopropanyl, ethoxycyclopropanyl, butoxycyclohexanyl, methoxycyclobutanyl, ethoxycyclobutanyl, methoxycyclopentanyl, ethoxycyclopentanyl, methoxycyclohexanyl, ethoxycyclohexanyl, propoxycyclohexanyl, methoxycycloheptanyl, methoxycyclooctanyl, methoxynorbornyl and methoxyadamantyl.

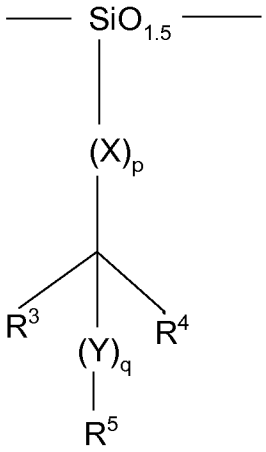
8. (Original) The resist composition of claim 1, wherein said cyclic ketal acid-labile moiety is substituted.

9. (Original) The resist composition of claim 1, wherein said cyclic ketal acid-labile moiety is substituted with fluorine or a hydrophobic moiety selected from the group consisting of —CF_3, —CHF_2, —CH_2F, —CCl_3, —$CHCl_2$ and —CH_2Cl, and —$Si(CH_3)_3$.

10. (Original) The resist composition of claim 3, wherein at least a portion of said solubility promoting moiety is fluorinated.

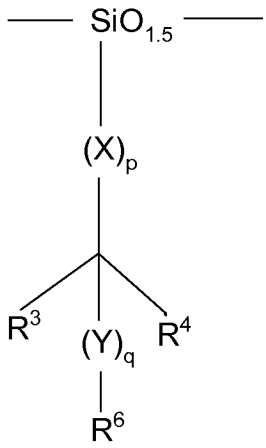
11. (Original) The resist composition of claim 1, wherein said silsesquioxane polymer has a weight average molecular weight of about 800 to 500,000.

12. (Original) The resist composition of claim 1, wherein said imaging polymer comprises a combination of monomeric units (II) and (III) described by the formulas:



(II)

and



(III)

in which

each R^3 is independently selected from the group consisting of a hydrogen atom, a halogen atom, a linear alkyl, a branched alkyl, a cycloalkyl, a halogenated linear alkyl, a halogenated branched alkyl, a halogenated cycloalkyl, an aryl, a halogenated aryl, or any combination thereof,

each X is independently selected from the group consisting of an oxygen atom, a sulfur atom, NR^3, a linear alkyl, a branched alkyl, a cycloalkyl group, a halogenated linear alkyl, a halogenated branched alkyl, a halogenated cycloalkyl, an aryl group, or a halogenated aryl, wherein p is an integer having the value 1 or 0,

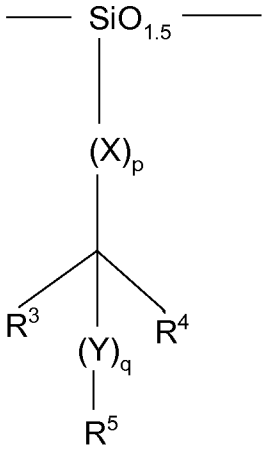
each Y is independently selected from the group consisting of a linear alkyl, a branched alkyl, a cycloalkyl group, a halogenated linear alkyl, a halogenated branched alkyl, a halogenated cycloalkyl, an aryl group, or a halogenated aryl, wherein q is an integer having the value 1 or 0,

each R^4 is independently selected from the group consisting of a fluorine atom, a fluorinated linear alkyl, a fluorinated branched alkyl, a fluorocycloalkyl, a fluoroaryl, or any combination thereof,

each R^5 is independently a solubility inhibiting cyclic ketal group, and

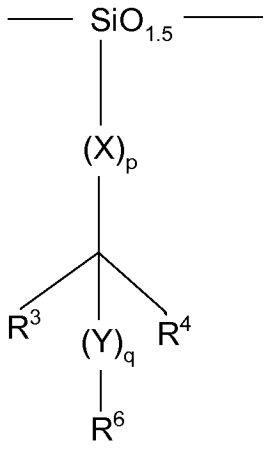
each R^6 is independently a solubility promoting group.

13. (Original) The resist composition of claim 1, wherein said imaging polymer comprises a combination of monomeric units (III) and (IV) or units (II) and (V), wherein the monomeric units (II) and (III) are described by the formulas:



(II)

and



(III)

in which

each R^3 is independently selected from the group consisting of a hydrogen atom, a halogen atom, a linear alkyl, a branched alkyl, a cycloalkyl, a halogenated linear alkyl, a halogenated branched alkyl, a halogenated cycloalkyl, an aryl, a halogenated aryl, or any combination thereof,

each X is independently selected from the group consisting of an oxygen atom, a sulfur atom, NR^3, a linear alkyl, a branched alkyl, a cycloalkyl group, a halogenated linear alkyl, a halogenated branched alkyl, a halogenated cycloalkyl, an aryl group, or a halogenated aryl, wherein p is an integer having the value 1 or 0,

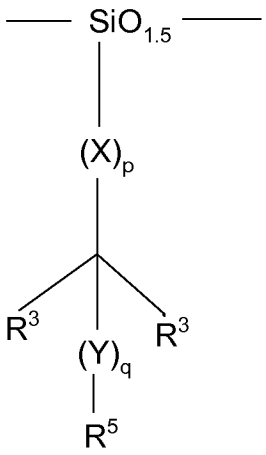
each Y is independently selected from the group consisting of a linear alkyl, a branched alkyl, a cycloalkyl group, a halogenated linear alkyl, a halogenated branched alkyl, a halogenated cycloalkyl, an aryl group, or a halogenated aryl, wherein q is an integer having the value 1 or 0,

each R^4 is independently selected from the group consisting of a fluorine atom, a fluorinated linear alkyl, fluorinated branched alkyl, a fluorocycloalkyl, a fluoroaryl, or any combination thereof,

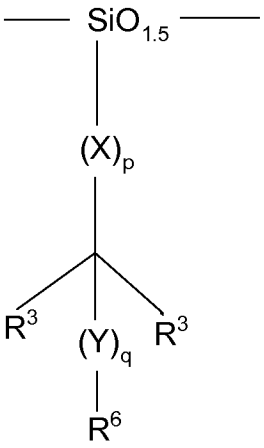
each R^5 is independently a solubility inhibiting cyclic ketal group, and

each R^6 is independently a solubility promoting group; and

the monomeric units (IV) and (V) are described by the formulas:



(IV) and

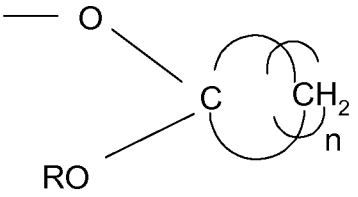


(V).

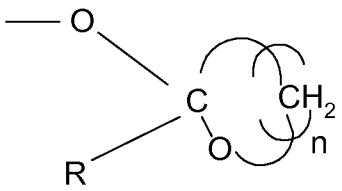
14. (Currently Amended) A method of forming a structure on a substrate, said method comprising the steps of:

providing a substrate;

applying a resist composition to said substrate to form a resist layer on said substrate, said resist composition comprising an acid-sensitive imaging polymer comprising a silsesquioxane backbone, and a solubility inhibiting pendant cyclic ketal acid-labile moiety having a low activation energy less than about 20 kcal/mol for acid-catalyzed cleaving, wherein said acid-labile moiety is cleavable at room temperature, and wherein said cyclic ketal acid-labile moiety comprises a structure of the form



or



where n is any integer from 2 to 15 and R is an alkyl or a halogenated alkyl, and wherein at least a portion of said imaging polymer is fluorinated and said imaging polymer further comprises a pendant solubility promoting moiety selected from the group consisting of a fluoroalcohol, a carboxylic acid, an amino group, an imino group, a fluorinated imino group and a fluorinated amino group, wherein said pendant solubility promoting moiety is protected with said cyclic ketal acid-labile moiety; and

patternwise exposing said substrate to radiation, whereby acid is generated by said radiation-sensitive acid generator in exposed regions of said resist layer;

removing patternwise soluble portions of said resist layer to form a pattern of spaces in said resist layer; and

transferring said pattern of spaces to said substrate.

15. (Original) The method of claim 14 further comprising the step of baking the exposed resist layer to promote acid-catalyzed reaction in exposed portions of said resist layer.

16. (Original) The method of claim 14 wherein said resist composition further comprises a radiation-sensitive acid generator.

17. (Canceled)

18. (Canceled)

19. (Original) The method of claim 14, wherein at least a portion of said solubility inhibiting pendant cyclic ketal acid-labile moiety is fluorinated.

20. (Canceled)

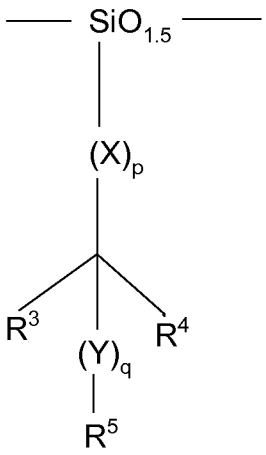
21. (Original) The method of claim 14, wherein said cyclic ketal acid-labile moiety is selected from the group consisting of methoxycyclopropanyl, ethoxycyclopropanyl, butoxycyclohexanyl, methoxycyclobutanyl, ethoxycyclobutanyl, methoxycyclopentanyl, ethoxycyclopentanyl, methoxycyclohexanyl, ethoxycyclohexanyl, propoxycyclohexanyl, methoxycycloheptanyl, methoxycyclooctanyl, methoxynorbornyl and methoxyadamantyl.

22. (Original) The method of claim 14, wherein said cyclic ketal acid-labile moiety is substituted.

23. (Original) The method of claim 14, wherein said cyclic ketal acid-labile moiety is substituted with fluorine or a hydrophobic moiety selected from the group consisting of —CF_3, —CHF_2, —CH_2F, —CCl_3, —$CHCl_2$ and —CH_2Cl, and —$Si(CH_3)_3$.

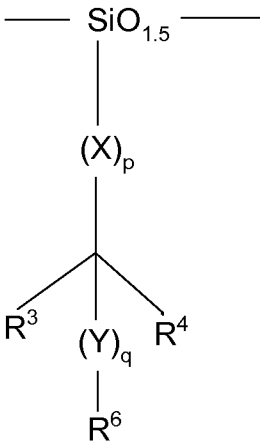
24. (Original) The method of claim 14, wherein said silsesquioxane polymer has a weight average molecular weight of about 800 to 500,000.

25. (Original) The method of claim 14, wherein said imaging polymer comprises a combination of monomeric units (II) and (III) described by the formulas:



(II)

and



(III)

in which

each R^3 is independently selected from the group consisting of a hydrogen atom, a halogen atom, a linear alkyl, a branched alkyl, a cycloalkyl, a halogenated linear alkyl, a halogenated branched alkyl, a halogenated cycloalkyl, an aryl, a halogenated aryl, or any combination thereof,

each X is independently selected from the group consisting of an oxygen atom, a sulfur atom, NR^3, a linear alkyl, a branched alkyl, a cycloalkyl, a halogenated linear alkyl, a halogenated branched alkyl, a halogenated cycloalkyl, an aryl group, or a halogenated aryl, wherein p is an integer having the value 1 or 0,

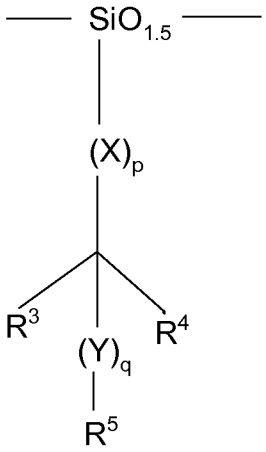
each Y is selected from the group consisting of a linear alkyl, a branched alkyl, a cycloalkyl group, a halogenated linear alkyl, a halogenated branched alkyl, a halogenated cycloalkyl, an aryl group, or a halogenated aryl, wherein q is an integer having the value 1 or 0,

each R^4 is selected from the group consisting of a fluorine atom, a fluorinated linear alkyl, a fluorinated branched alkyl, a fluorocycloalkyl, a fluoroaryl, or any combination thereof,

each R^5 is independently a cyclic ketal solubility inhibiting group, and

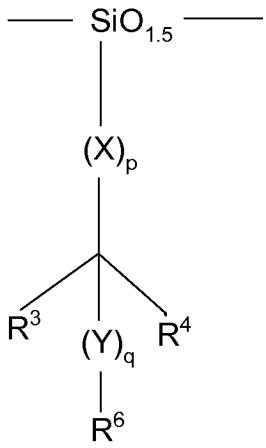
each R^6 is independently a solubility promoting group.

26. (Original) The method of claim 14, wherein said imaging polymer comprises a combination of monomeric units (III) and (IV) or units (II) and (V), wherein the monomeric units (II) and (III) are described by the formulas:



(II)

and



(III)

in which

each R^3 is independently selected from the group consisting of a hydrogen atom, a halogen atom, a linear alkyl, a branched alkyl, a cycloalkyl, a halogenated linear alkyl, a halogenated branched alkyl, a halogenated cycloalkyl, an aryl, a halogenated aryl, or any combination thereof,

each X is selected from the group consisting of an oxygen atom, a sulfur atom, NR^3, a linear alkyl, a branched alkyl, a cycloalkyl group, a halogenated linear alkyl, a halogenated branched alkyl, a halogenated cycloalkyl, an aryl group, or a halogenated aryl, wherein p is an integer having the value 1 or 0,

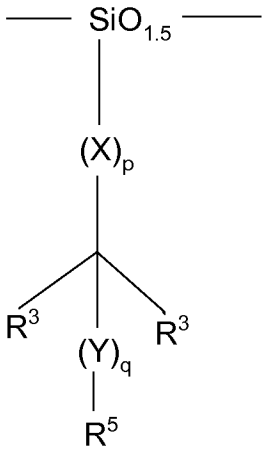
each Y is selected from the group consisting of a linear alkyl, a branched alkyl, a cycloalkyl group, a halogenated linear alkyl, a halogenated branched alkyl, a halogenated cycloalkyl, an aryl group, or a halogenated aryl, wherein q is an integer having the value 1 or 0,

each R^4 is independently selected from the group consisting of a fluorine atom, a fluorinated linear alkyl, a fluorinated branched alkyl, a fluorocycloalkyl, a fluoroaryl, or any combination thereof,

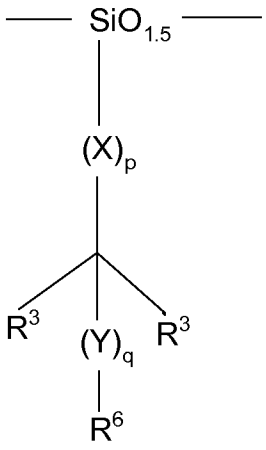
each R^5 is independently a cyclic ketal solubility inhibiting group, and

each R^6 is independently a solubility promoting group; and

the monomeric units (IV) and (V) are described by the formulas:



(IV) and



(V).

27. (Original) The method of claim 14, further comprising forming a planarizing layer over said substrate, wherein said resist layer is applied directly to said planarizing layer, and etching said planarizing layer through said pattern of spaces in said resist layer to expose said substrate.

28. (Original) The method of claim 27, wherein said planarizing layer has an underlayer composition comprising:

(A) a polymer containing (i) cyclic ether moieties, (ii) saturated polycyclic moieties, and (iii) aromatic moieties if said underlayer composition does not require a separate crosslinker, or

(B) a polymer containing (i) saturated polycyclic moieties, and (ii) aromatic moieties if said underlayer composition requires a separate crosslinker.

29. (Original) The method of claim 28, wherein said underlayer composition further comprises a fluorinated polycyclic moiety, a fluorinated aromatic moiety or a combination thereof.

30. (Original) The method of claim 14, wherein said step of transferring further comprises a method selected from the group consisting of depositing, implanting, plating and etching.

REMARKS

Claims 1-5, 7-19 and 21-30 are all the claims pending in the present application.

Claims 1 and 14 have been amended to clarify that said imaging polymer further comprises a pendant solubility promoting moiety selected from the group consisting of a fluoroalcohol, a carboxylic acid, an amino group, an imino group, a fluorinated imino group and a fluorinated amino group, wherein said pendant solubility promoting moiety is protected with said cyclic ketal acid-labile moiety. No new matter has been added.

Claims 3, 4, 17 and 18 have been canceled.

Claims 1-5, 7-19 and 21-30 stand rejected on prior art grounds.

Reconsideration of the Examiner's prior art rejections is respectfully requested based on the following discussion.

I. The 35 U.S.C. §103(a) Rejection based on Sooriyakumaran et al. in view of Bucchignano et al.

Claims 1-5, 7-19, 21-27 and 30 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Sooriyakumaran et al. (US 2002/0081520 A1) in view of Bucchignano et al. (6,037,097). Claims 3, 4, 17 and 18 have been canceled, rendering those rejections moot.

Applicants submit that there was no reasonable expectation of success to combine the teachings of Sooriyakumaran et al. with the teachings of Bucchignano et al. to arrive at the present invention. Applicants refer the Examiner to the publication by Schmaljohann et al. and US Patent 5,919,597 to Sinta et al. (hereinafter "Sinta"), which Applicants have provided with an Information Disclosure Statement, as evidence that there was no reasonable expectation of success to combine the teachings of Sooriyakumaran et al. and Bucchignano et al., without undue experimentation.

More specifically, synthesizing cyclic ketal protecting groups on larger pendant solubility promoting moieties in the structure of the present invention or

Sooriyakumaran et al. is more difficult than in the structure of Bucchignano et al. and will not necessarily result in the desired resist composition. For example, in Schmaljohann et al., it was found that a protection reaction with *p*-toluene sulfonic acid as catalyst protects the acidic α-trifluoromethyl alcohol groups to only a small extent, whereas more powerful neutral catalysts like ATPB give high conversion for the protection reaction (see Schmaljohann et al., page 332, Scheme 2). In the structure according to the present application, the solubility promoting moiety, such as fluoroalcohol, is even larger than the α-trifluoromethyl alcohol group of Schmaljohann et al., thus suggesting that an even more powerful catalyst may be required for the protection reaction.

On the other hand, in the case of an acid-catalyzed condensation to provide pendant acid-labile groups, it has been found that stronger catalysts than oxalic acid or malonic acid, such as *p*-toluene sulfonic acid, can result in significant reaction exotherms, which can cause formation of undesired side products. Similarly, weaker acids, such as p-hydroxybenzoic acid, may be less preferred because such catalysts can provide inadequate reaction rates at desired reaction temperatures. (see Sinta at col. 5, lines 38-50). Thus, although the use of a stronger catalyst may result in a successful protection reaction, undesired side products may render the photoresist unsuitable for its intended purpose. (see Sinta at col. 1, lines 48-49).

Thus, Applicants submit that there was no reasonable expectation of success to combine the teachings of Sooriyakumaran et al. with the teachings of Bucchignano et al. to arrive at the present invention, and thus one skilled in the art would not find it obvious to modify or combine the teachings of Sooriyakumaran et al. with the teachings of Bucchignano et al. to arrive at the present invention.

Thus, Applicants respectfully request that these rejections be reconsidered and withdrawn.

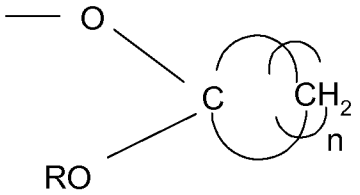
II. The 35 U.S.C. §103(a) Rejection based on Sooriyakumaran et al. in view of Bucchignano et al. and further in view of Khojasteh et al.

Claims 28 and 29 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Sooriyakumaran et al. (US 2002/0081520 A1) in view of Bucchignano et al. (6,037,097) and further in view of Khojasteh et al. (US 2002/0058204 A1).

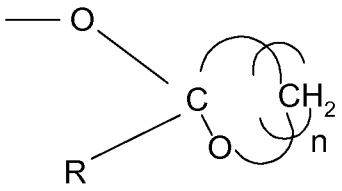
As discussed above, there was no reasonable expectation of success and it was non-obvious to combine the teachings of Sooriyakumaran et al. and Bucchignano et al. to arrive at the present invention.

Khojasteh et al. fails to overcome the deficiencies of Sooriyakumaran et al. and Bucchignano et al., individually or in combination. As understood, Khojasteh et al. disclose compositions suitable for forming planarizing underlayers for multilayer lithographic processes are characterized by the presence of (A) a polymer containing: (i) cyclic ether moieties, (ii) saturated polycyclic moieties, and (iii) aromatic moieties for compositions not requiring a separate crosslinker, or (B) a polymer containing: (i) saturated polycyclic moieties, and (ii) aromatic moieties for compositions requiring a separate crosslinker. (Abstract)

However, Khojasteh et al., individually or in combination with Sooriyakumaran et al. and Bucchignano et al., fail to render obvious each and every aspect of the present invention. In particular, the prior art, individually or in combination, fail to render obvious a resist composition comprising an acid-sensitive imaging polymer including a silsesquioxane backbone and a solubility inhibiting cyclic ketal pendant acid-labile moiety having a low activation energy less than about 20 kcal/mol for acid-catalyzed cleaving, wherein said acid-labile moiety is cleavable at room temperature, and wherein said cyclic ketal acid-labile moiety comprises a structure of the form



or



where n is any integer from 2 to 15 and R is an alkyl or a halogenated alkyl, and wherein at least a portion of said imaging polymer is fluorinated and said imaging polymer further comprises a pendant solubility promoting moiety selected from the group consisting of a fluoroalcohol, a carboxylic acid, an amino group, an imino group, a fluorinated imino group and a fluorinated amino group, wherein said pendant solubility promoting moiety is protected with said cyclic ketal acid-labile moiety.

Thus, Applicants submit that claims 28 and 29 are patentable over the cited references, and respectfully request that these rejections be reconsidered and withdrawn.

CONCLUSION

In view of the foregoing, Applicants submit that claims 1-2, 5, 7-16, 19 and 21-30, all the claims currently being examined in the application, are patentably distinct from the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time. Should the Examiner find the application to be other than in condition for allowance, the Examiner is invited to contact the undersigned at the telephone number listed below to discuss any other changes deemed necessary. The Commissioner is authorized to charge any additional fees due or credit overpayments to Deposit Account No. 09-0458.

Applicants' undersigned attorney may be reached by telephone at (845) 894-6919. All correspondence should continue to be directed to the address listed below.

Respectfully submitted,
/Todd M. C. Li/
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